



# FRA Initiatives PTC

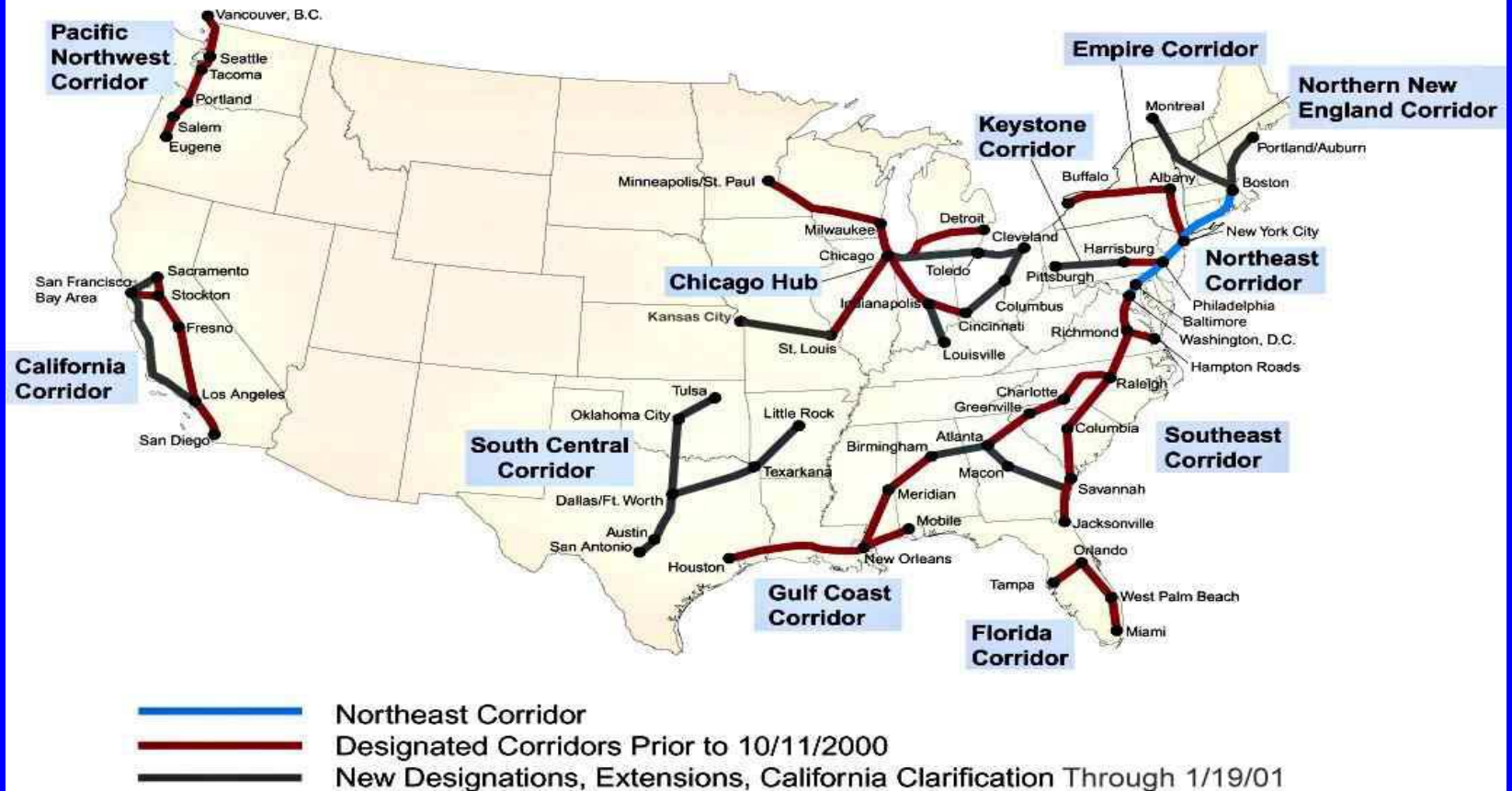
Terry Tse  
Program Manager – Advanced Train Control

# FRA Strategic Objectives

- **Improve safety in railroad operation**
  - Promote technology development and demonstration
  - PTC is on NTSB most wanted list
  - PTC prevents collisions, overspeed derailments and protects roadway workers
- **Improve mobility for the public**
  - In partnership with states
  - Create high speed passenger corridors on existing routes
  - Produce cost effective design of modern train control systems for both passenger and freight operations
- **Enhance the railroad system as a national transportation resource**
  - Better infrastructure/signal system
  - Promote safe, smooth and efficient railroad operation

# Next Generation High Speed Rail Technology Development

Designated High Speed Rail Corridors As Of 1/19/01



## **Next Generation High Speed Rail Technology Development Need for PTC**

*49CFR236.0.d Where any train is operated at a speed of 80 or more miles per hour, an automatic cab signal, automatic train stop or automatic train control system complying with the provisions of this part (49CFR236) shall be installed.*

Alternative is to use advanced system with PTC

## **Next Generation High Speed Rail Technology Development PTC Development History**

- **1995 – launch of Next Generation High Speed Passenger Rail (NGHSR) Program**
- **Alternative with 21<sup>st</sup> century technology – Positive Train Control**
- **FRA solicited proposal for equipping high speed corridors with PTC**
- **Six submitted on six different corridors – 2 selected**
- **First primary focus is on ITCS system in Michigan, awarded to Harmon Industries, now GETS-GS, in 1996**
- **Memorandum of Understanding signed among stakeholders of NAJPTC, in 1998**
- **Second system is generally known as IDOT PTC, awarded to Lockheed Martin in 2000**
- **ITCS in operation at 79 mph in early 2001 and 90 mph in January 2002**
- **IDOT PTC passed Build 1 test in October 2003**
- **Signed co-op agreements with WDOT, RRF, BNSF, ARRC, UVA & RRF for misc. PTC related development projects starting from FY2003.**

# **Summary of Program Support**

## **Train Control Systems**

### **Next Generation High Speed Rail**

- Offer through co-operative agreements funding support up to 50% in several PTC development/demonstration projects
- Support basic research in risk assessment, communication, location determination technology and system integration
- Start on-going co-operation with WCTF and RETF through AAR and Railroad Research Foundation
- Fund other innovative special projects through BAA process

## **Broad Agency Announcement (BAA)**

- BAA for FY05 in the process of published and announced
- Will consider proposals with ideas for development and innovation that help to enable high speed operation.
- Areas to be considered
  - Train Control System
  - Locomotive Propulsion
  - Track System
  - Grade Crossing related
  - Communication
- Funding normally in the range of 200K-500K

## **NAJPTC (IDOT PTC) Program Objectives**

- Support IDOT high speed initiative for 110 mph passenger train operation between Chicago and St. Louis
- Enhance operating safety of revenue PSGR/FRT operations
- Demonstrate flexible block operation for cost effective improvement of line capacity
- Develop interoperability standards
- First fully-compliant test case of FRA's NPRM on microprocessor controlled train control system.

# NAJPTC IDOT PTC Territory



PTC Zone

**Mazonia – Bloomington  
fixed block**

**Bloomington – Ridgely  
flexible block**



Flexible block can reduce headway and increase capacity  
A potential business benefit for the freight railroads

# NAJPTC Program Funding

(in millions)

<i>Funding source In millions</i>	<i>FRA</i>	<i>IDOT</i>	<i>AAR</i>	<i>Lockheed Martin/ Wabtec</i>	<i>Total</i>
As of FY04	45.8	16.6	21 *	16.0	<b>99.4</b>
Anticipated FY05	6.5	---	---	---	<b>6.5</b>
Total by source	52.3	16.6	21 *	16.0	<b>105.9</b>

\*\$1 million contributed by Union Pacific Railroad

FRA funding is about 49% of the total

# NAJPTC

## In Progress and 2005 Planning

- System (hardware/software) Integration being tested
- Schedule:
  - Field Trial 2/15-3/7
  - Factory Acceptance Test 3/24-4/19
  - Formal Field Test 4/27-7/26
- Interim PSP (Product Safety Plan) being finalized
- Field trials and tests in Q1 & Q2 CY2005
- Submit final PSP Q3 CY2005
- Expect to begin high-speed Revenue Service Q1 CY2006

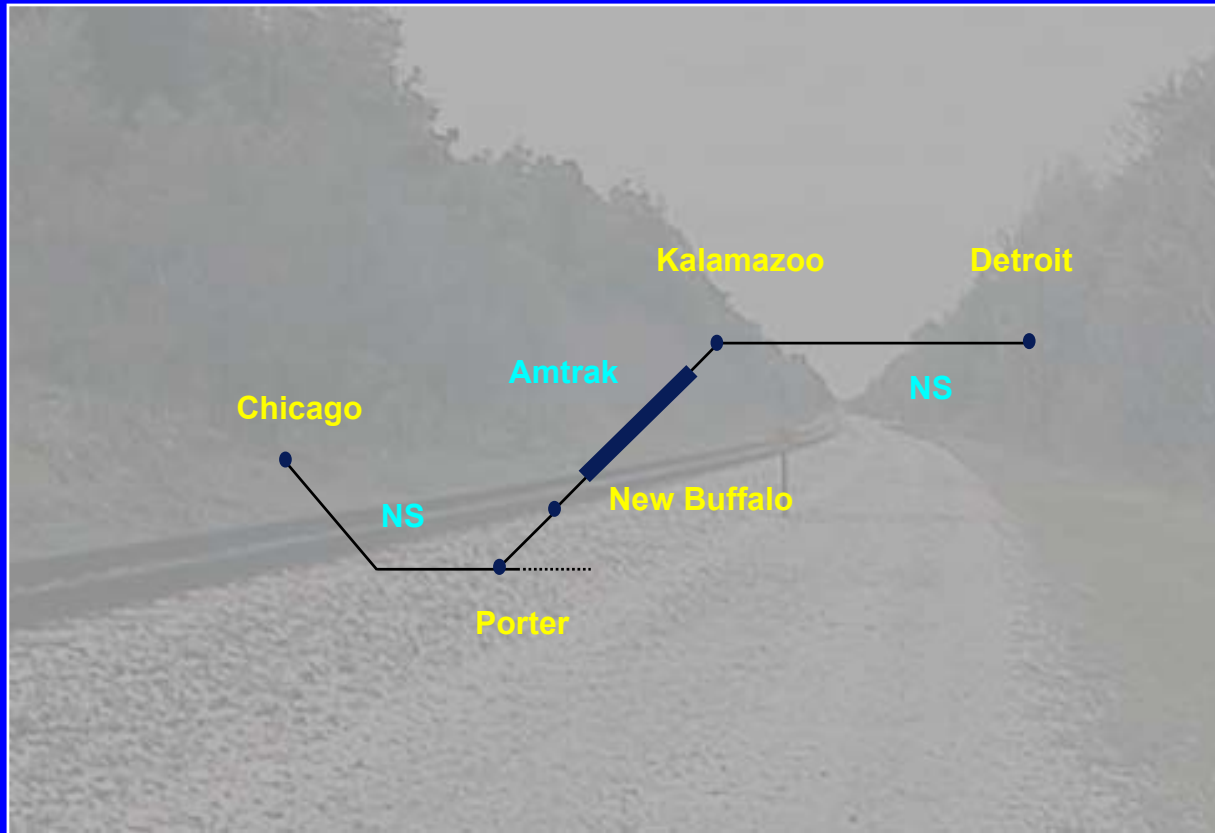
# Incremental Train Control System (ITCS)

The ITCS is a communication-based signaling system overlaid on an existing signal system in HSR revenue service at 90 mph today.

- Design and installation initiated in 1996 on Michigan Line with Harmon Electronics (now part of GETS-Global Signaling) as the supplier
- Enforces signal indications, civil speed limits, and temporary slow orders
- Advances start of 57 public crossings
- Design maximum speed – 125 mph (110 mph in Michigan)

# ITCS

## Where is it ?



**ITCS Territory**

## Incremental Train Control System Revenue Service Status

### Implementation timeline

Phase	Start Date	Enforcement on Engineers' Action?	Maximum Speed	Miles in service
Demo	September 30, 1996	NO	100 mph	Testbed only
1	3/20/00-pass 8/10/00-frt	NO	79 mph	Shake-down
2	9/23/00	YES	79 mph	20 miles
2	12/20/00	YES	79 mph	45 miles
3	1/7/02	YES	90 mph	45 miles
3	???	YES	90 mph	66 miles
4	???	YES	110 mph	66 miles

# ITCS

## Funding Overview

(in millions)

<i>Funding source In millions</i>	<i>FRA</i>	<i>MDOT</i>	<i>Amtrak</i>	<i>GETS- GS</i>	<i>Total</i>
As of FY03	19.0	11.7 *	3.9	4.9	<b>39.5</b>
Anticipated FY04/FY05	---	---	---	---	---

\* Include other infrastructure upgrade, e.g. track, signals, grade crossings and stations

FRA funding is about 48% of the total

# ITCS

## In Progress and 2005 Planning

- Contract awarded to GETS-GS to complete Software Verification & Validation by mid-2006 (funded from FRA share)
- Contract for a 3<sup>rd</sup> party audit awarded to Battelle Laboratory
- Will upgrade to 110 mph upon V&V completion with FRA's approval.
- Weakest Link is the RF System – continuing to look for ways to improve
- Wayside data radio network (WLAN) is being upgraded with asynchronous spread spectrum radios

## Wisconsin PTC (with Canadian Pacific Railway, CPR)

- Use PTC compatible CTC equipment to re-signal 20 miles of double track for bi-directional train operation between Milwaukee-Madison, WI
- Upgrade/construct new #20 crossovers by the end of 2003
- Install ATCS base radios to control CTC
- Define interface between CPR Computer Aided Dispatching and NAJPTC PTC specification, specially OCS, CPR dark territory track warrant system
- Dispatch office change with addition of packet switches to control new CTC via ATCS radio
- Federal Funding \$2M (FY2002)

## BNSF ETMS System

- 130 miles, Beardstown subdivision, Beardstown-Centralia, IL
- ETMS is designed and manufactured by Wabtec
- Equip 50 locomotives and 70 wayside locations with PTC equipment (Wabtec and Meteorcomm)
- FRA Railroad Development funded \$600K, a small portion of the development cost
- Office of Safety granted a waiver for pilot testing
- Currently at the end of Phase 1 with enforcement turned off. Phase 2 will start soon upon approval by Office of Safety

## Alaska Railroad Corp Collision Avoidance System (CAS)

- 40 mile CTC with remote controlled switches and 490 miles dark territory to be eventually equipped with PTC
- Equip all 58 locomotives and at least 28 base stations
- Some switches in the non-signaled territory will be monitored
- Completed contracts with Quantum Engineering – locomotives have tracking capability
- Contracted US&S to develop the CAD (Computer Aided Dispatch System)
- Funded by FRA outside Next Generation High Speed Passenger Program
- Future development will include upgrade to wayside and locomotives for PTC functions and enforcement

## Moving PTC Forward Industry-Wide

- CSXT CBTM (FRA funded ASCAP simulation for a safety case)
- TTCI Communication Test Bed
- TTCI PTC Test Bed
- Communication Management Unit (CMU)
- RCL Protocol Standard Testing
- EIC (Employee-in-Charge) Portable Remote Terminal
- Universal On Board Platform (UOP)
- Complete NDGPS network
- Co-operate with WCTF and RETF with funding and technical support

# Roadblocks to Deployment

- Technical Concerns
- Institutional Concerns
- Cost Considerations

# Roadblocks to Deployment

## Technical concerns

- Basic functions – Is capability adequate?
  - Communication
  - Location Determination System
  - Braking algorithm
- Reliability
- Risk of reduced safety from over-reliance of an imperfect or unreliable system
- False alarms – stop trains frequently
- Necessary information may not be readily available
  - Track database
  - Accurate consist information

# Roadblocks to Deployment

## Institutional Concerns

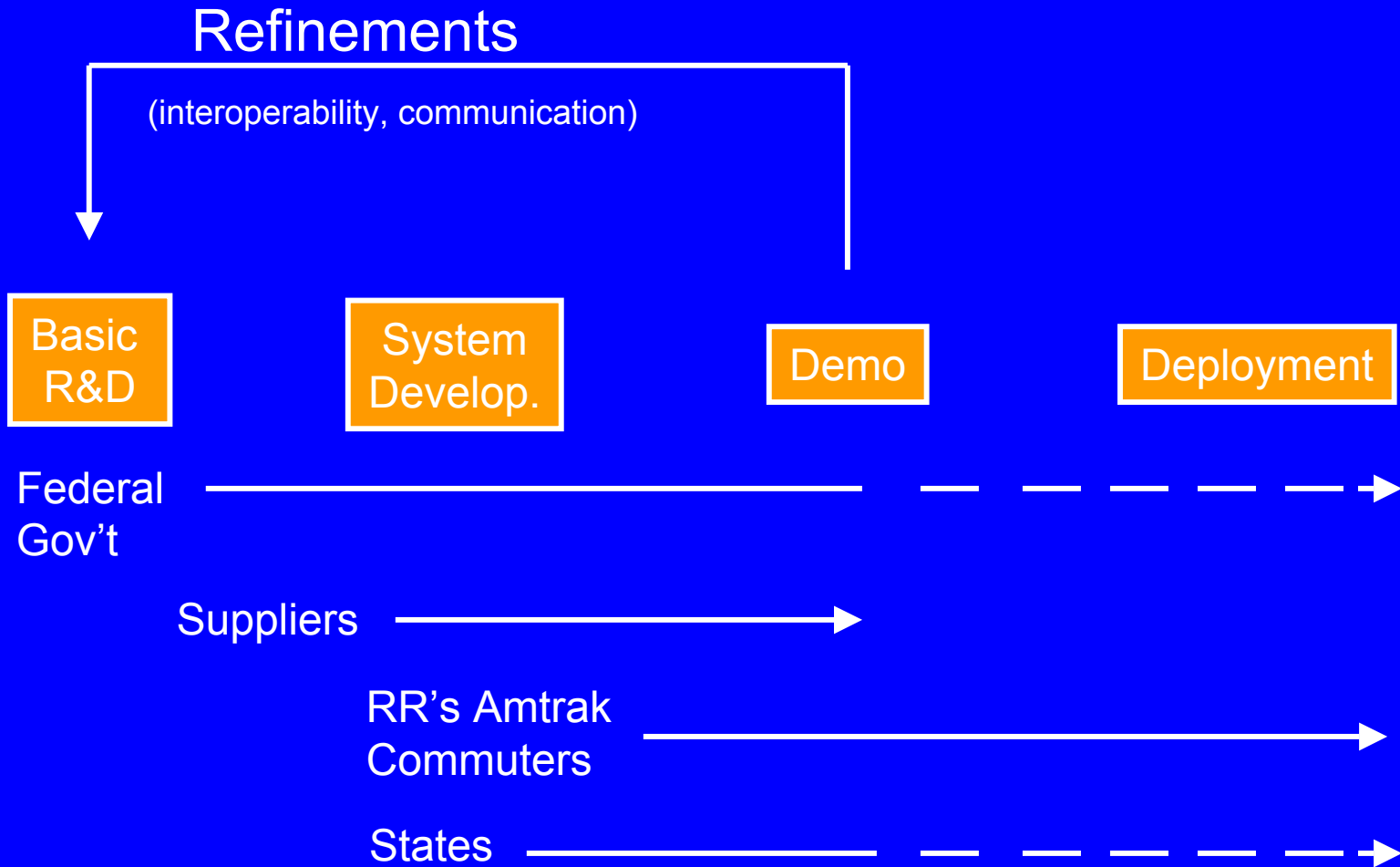
- Might prevent using motive power flexibly
  - Unequipped units may be banned from PTC territory
  - If equipped, may not be usable due to lack of interoperability
- Might trigger “unfunded mandate”
- Forced slowdowns might degrade existing service quality
- Deferring decision might get much better system in performance and cost
- Uncertainty in how to comply with the new PTC rule

# Roadblocks to Deployment

## Cost Considerations

- Initial capital outlay
  - Equipment, infrastructure, and computer purchases
  - Installation cost
  - Qualification and testing
  - Regulation required analyses, risk assessment and V&V
  - Employee training
- Life cycle – maintenance and replacement
- Short life span of computer (obsolescence)

# Path to Deployment – who can/will invest?



## **Future Federal Role (elimination of deployment roadblocks)**

- Support various demonstrations to prove PTC technology
- Develop improved technologies in communication and location determination system as system refinement
- Support operational tests to monitor reliability and dependability
- Promote & encourage interoperability through technology development, e.g. UOP
- Demonstrate compliance with new performance-based PTC rule – establishing a benchmark
- Support fully integrated network among intercity passenger, commuter, and freight railroads
- Establish forum for communication, information exchanges and co-operative efforts